



US005555894A

United States Patent [19][11] **Patent Number:** **5,555,894****Doyama et al.**[45] **Date of Patent:** **Sep. 17, 1996**

[54] **FORCE SENSATION EXHIBITING DEVICE,
DATA INPUT DEVICE AND DATA INPUT
EQUIPMENT**

4,949,729 8/1990 Haski 128/782
4,986,280 1/1991 Marcus et al. 128/782
5,329,813 7/1994 Lewis 128/774
5,381,805 1/1995 Tuckett et al. 128/739

[75] Inventors: **Yoshiaki Doyama**, Hirakata; **Masataka Ozeki**, Osaka; **Keizo Matsui**, Kobe; **Yoshiteru Ito**, Takatsuki, all of Japan

FOREIGN PATENT DOCUMENTS

1175432 8/1985 U.S.S.R. 128/774

[73] Assignee: **Matsushita Electric Industrial Co., Ltd.**, Osaka, Japan

Primary Examiner—Max Hindenburg
Attorney, Agent, or Firm—Beveridge, DeGrandi, Weilacher & Young, LLP

[21] Appl. No.: **235,948**

[22] Filed: **May 2, 1994**

[30] Foreign Application Priority Data

May 11, 1993 [JP] Japan 5-109529
Sep. 28, 1993 [JP] Japan 5-241715
Dec. 28, 1993 [JP] Japan 5-336976

[51] **Int. Cl.⁶** **A61B 5/103**

[52] **U.S. Cl.** **128/782**

[58] **Field of Search** 128/739, 774,
128/782; 33/511, 512; 73/865.4

[56] References Cited**U.S. PATENT DOCUMENTS**

4,414,984 11/1983 Zarudiansky 128/774

[57] ABSTRACT

A data input device includes a housing which can be grasped by a hand. The housing is equipped with a detecting device that detects a displacement or pressure at a portion of the housing on which fingers are placed when the housing is grasped by the hand. The data input device may include plural sensors to detect displacement or pressure at several different finger belly portions of the fingers. Also, plural sensors may be provided for each finger belly portion. The data input device may be used to control the movement of remotely located mechanical fingers or virtual fingers shown on a display.

20 Claims, 37 Drawing Sheets